

## Oral pathology lec #4 & # 5

### Chapter 15: Odontomes & Odontogenic tumours

#### Part I: Odontomes

Do u remember when we took the hemangioma? We said it's not a true benign tumour, it's a hamartoma, and what's the hamartoma? It's a normal tissue but in abnormal amounts! The same applies to Odontomes i.e., they are hamartomas i.e., there is formation of dental tissues including dentin, pulp, enamel, but the form and architecture is abnormal.

#### **invaginated Odontomes or dense invaginatus**

Invagination of the enamel inside the crown or the pulp **before** calcification (otherwise enamel will break if invagination occurred after calcification).

**evaginated Odontomes:** do you remember the extra cusp on the premolar? There was enamel, dentin, & pulp>> if the occlusal trauma was enough, the cusp will break exposing the pulp. **The talon cusp** on the lateral incisors is also an evaginated Odontome.

**Enamel pearl** occur in the furcation area. It may contain only enamel, or it may contain enamel, dentin and pulp >> no treatment needed.

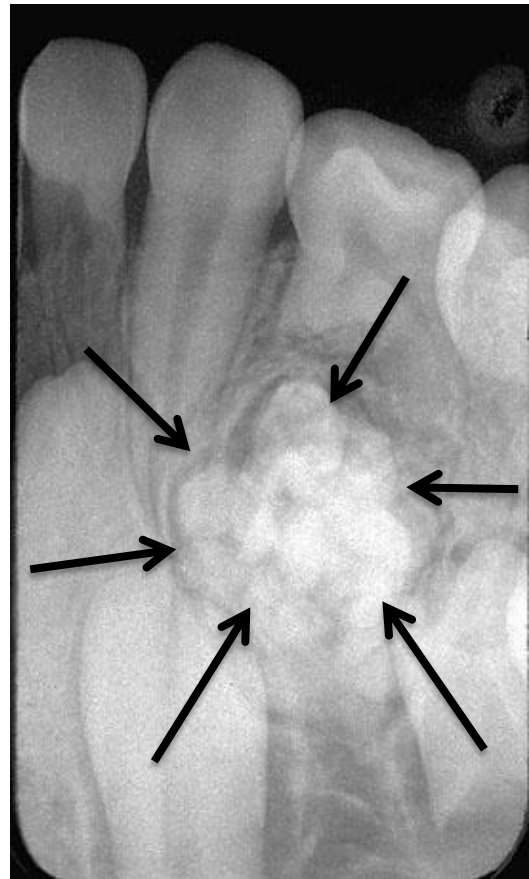
**Geminated Odontome** : these are better to be considered as structural anomalies.

:

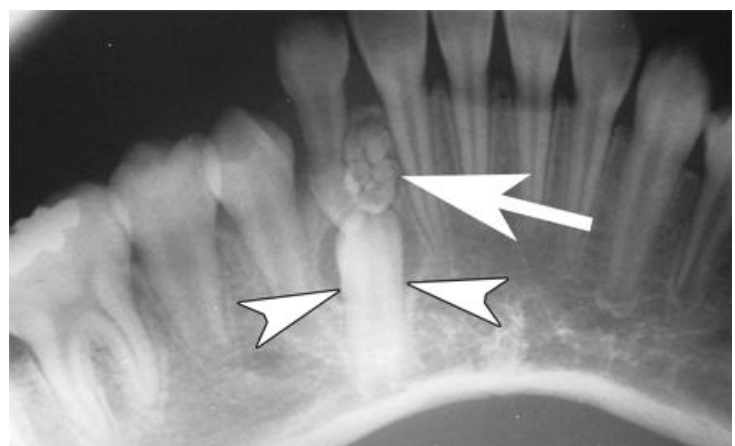
## Complex and compound Odontomes

Complex Odontome is a disorganized mass.

study this radiograph, you can notice that the complex Odontome is more radiopaque than the bone because it contains enamel, so it's more like teeth. But it's just a disorganized mass with a radiolucent rim. Imagine that this mass is a tooth and a dental follicle-like tissue surrounding it and it may develop a dentigerous cyst. **Commonly occurs in the post. Mandible in the premolar-molar region**



compare the radiograph above with this one. Here you see a more organized small masses each surrounded by a radiolucent rim. This is the **compound Odontome**. The compound Odontome consists of multiple tooth-like structures with radiolucent rim, this rim is a dental follicle-like tissue >> if its more than 6mm we'll consider it a dentigerous cyst >> so the



Odontome can have the complications of unerupted tooth. **Occurs in the ant. Maxilla**

Odontomes range between those 2 forms: complex which the best disorganized and compound which is the best organized.

Odontomes can be associated with permanent dentition with erupted tooth, unerupted tooth or even replacing a tooth.

Incidental radiographic finding bcz the pt usually doesn't complain of pain, bone expansion, tooth pain or perforation of the bone.

If u find a pt with Odontome u should follow up the pt to see if the radiolucent rim is increasing i.e., if the pt is developing a cyst or not. Or u simply remove it bcz it can develop any complication associated with impacted teeth.

**Occasional bone expansion or dentigerous cyst formation.**

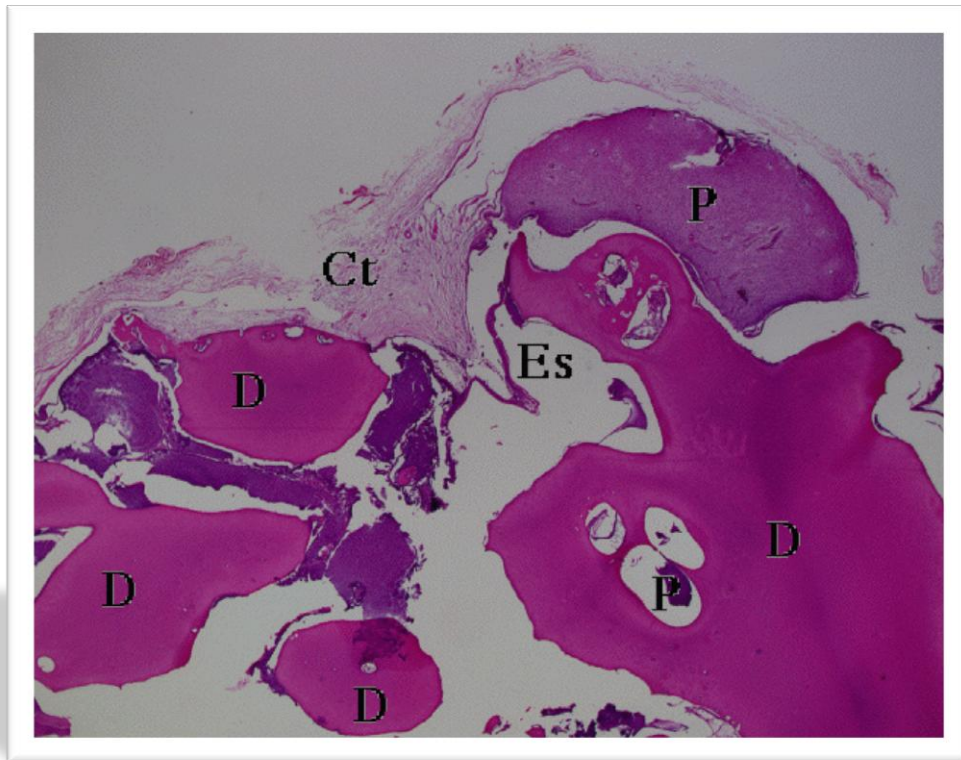
Majority are associated with the crowns of unerupted teeth.. Or it may take the place of the missing tooth i.e., the entire enamel organ transformed to form an Odontome.

**Odontomes can erupt, especially the compound Odontomes of the ant.**

**Region** (the pt feels that there is a tooth erupting after his permanent tooth has been lost) >> secondary infection may occur during eruption causing pain.

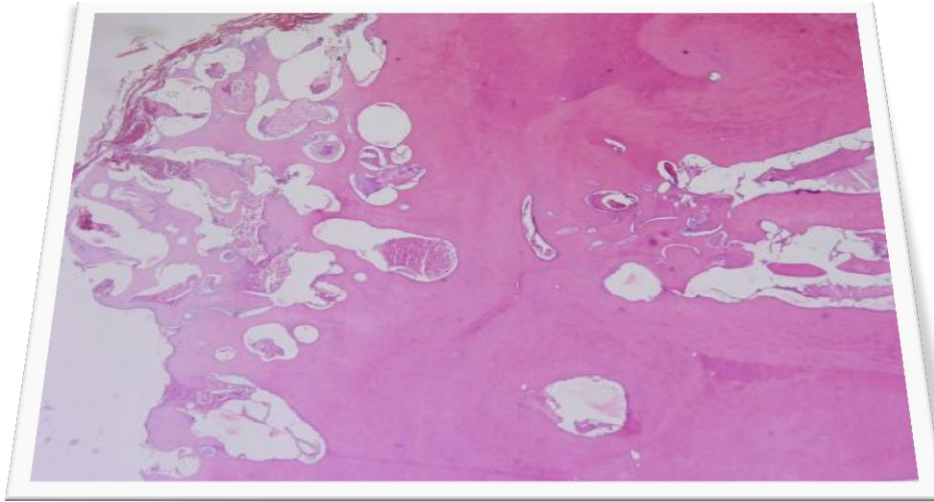


## histopathology of Odontomes :



In the figure above I can say this is a complex Odontome bcz I see dentine formation (D) here, pulp tissue there (P), and connective tissue (Ct) which is the follicle-like tissue surrounding the whole mass. It's like a big mass of disorganized dental tissue.





In this figure u can notice the difference in the organization of the tissues i.e., pulp, dentin then enamel or cementum. You can also see the fibrous tissue (the dental follicle-like tissue) surrounding each Odontome. This is much like a normal tooth structure.

Remnants of Odontogenic epithelium in general (reduced enamel epithelium, or any other remnant) can lead to formation of an Odontogenic cyst, Odontogenic tumour.

in 2003, the WHO has made some modifications to the tumours classification, the most important one to us is the Odontogenic Keratocyst OKC , they added it to the tumours list, it's now called **Keratinizing Cystic Odontogenic Tumour**. The calcifying Odontogenic cyst COC is now called **calcifying Cystic Odontogenic Tumour**. So these 2 are now considered benign tumours.

**Classification** of odontogenic tumours mainly depends on the **origin** :

❁ **epithelial origin only :**

Ameloblastoma, squamous odontogenic tumour, calcifying epithelial odontogenic tumour (CEOT), adenomatoid odontogenic tumour, Keratinizing Cystic Odontogenic Tumour.

❁ **mesenchymal origin only:**

odontogenic fibroma, myxoma, cementoblastoma.

❁ **epithelial and mesenchymal origin:**

- ❁ ameloblastic fibroma, ameloblastic fibro-odontoma, odontoameloblastoma, calcifying odontogenic cyst, dentinogenic ghost cell tumour , complex and compound odontomes (if we consider them tumours).



Enamel is epithelial in origin.  
Dentin, cementum and pulp  
are mesenchymal in origin. If  
u think of every lesion this  
way it will be easier for u to  
know the origin bcz u have to  
O.o

## Ameloblastoma:

### Clinical features :

**Most** common odontogenic tumour, if we exclude odontomes .its benign, but locally invasive and destructive. It's derived from odontogenic epithelium. More common in black Americans and West Africans.

2 variant forms: peripheral ameloblastoma & unicystic ameloblastoma, these 2 have different way of treatment compared to the regular (follicular).

80% in the post. Mandible. If it occurs in the maxilla, it will involve the maxillary sinus and expansion may occur later in the process bcz there is a space in the maxilla and nobody will recognize it.



It's usually asymptomatic unless bone expansion and perforation of the cortex occurs>> in the figure is a huge ameloblastoma that we usually don't see it in this aggressiveness >> perforation of the bone and extension into the soft tissues. Teeth may become loose.

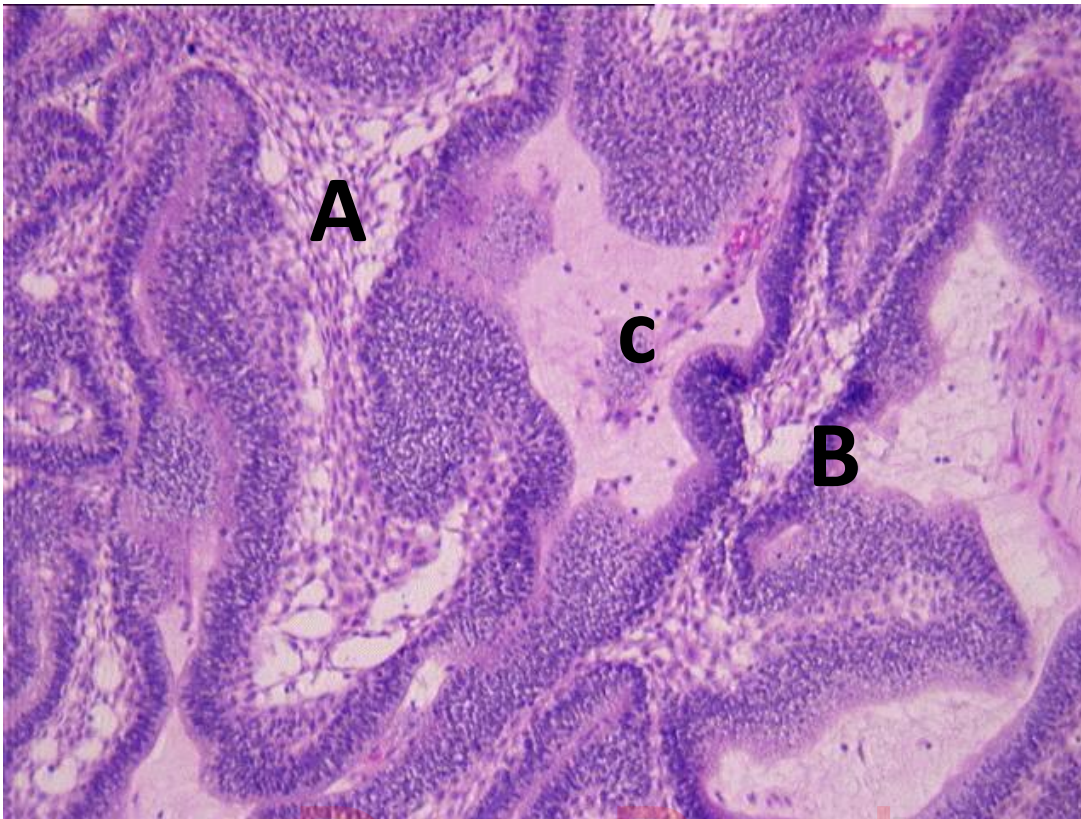


## Radiographic features:

Ameloblastoma is like the OKC, occur in the post. Mandible, could be uni or multi-locular (but larger than OKC), could be associated with impacted unerupted tooth, could occur as a periapical lesion, could be separating 2 teeth, it can cause root resorption, it may induce bone expansion >> ameloblastoma will proliferate in the marrow spaces >> complete removal of the lesion will be difficult >> recurrence rate is high >> if the lesion is unicystic then the treatment is just inoculation or curettage, otherwise it needs aggressive treatment.



## Histopathology:



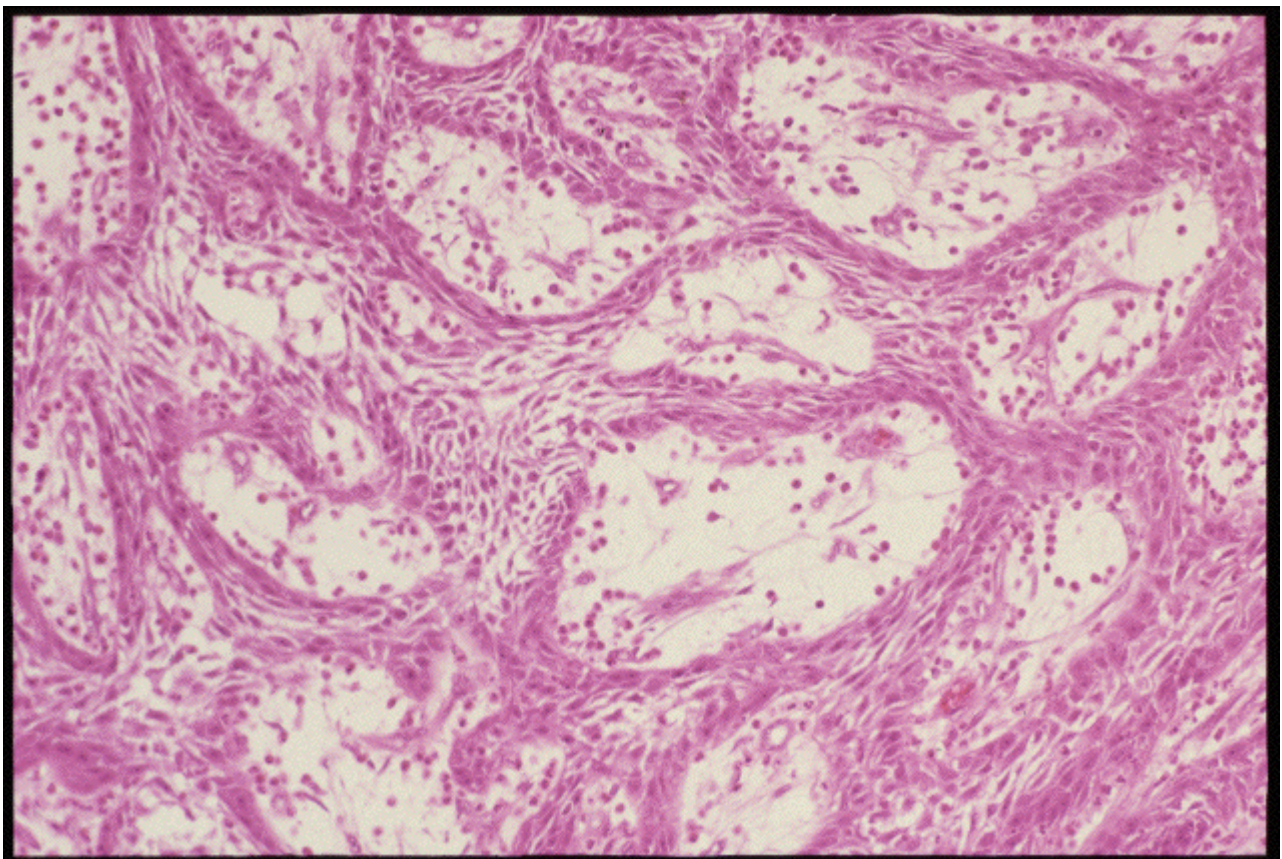
We see something that looks like the enamel organ, we have ameloblast-like cells (B), and stellate reticulum-like cells (A). But these ameloblasts are in the pre-secretory stage, so they won't form enamel. An important feature is **the polarization of the nuclei away from the surrounding tissue** (same as OKC). The peripheral columnar layer is hyperchromatic and the nuclei are polarized away from the surrounding connective tissue (toward the stellate reticulum-like cells). We have multiple follicles and in the center we may have cystic degeneration (C) (the same principle of radicular cyst formation).

The surrounding connective tissue isn't neoplastic (it's normal), it's not really cellular, it contains fibroblasts and collagen (remember that this tumour is epithelial in origin i.e., no connective tissue involvement).



Central stellate reticulum-like cells may show some changes, just like when we took the dentigerous cyst; the cells may form keratin, the cells are called **epidermoid-like cells**, and this phenomenon is called **squamous cell metaplasia**. Another form of changes that may occur is **granular cell metaplasia**. >> do these changes affect the treatment?? NO.

Another form of ameloblastoma that can be seen histopathologically is the **plexiform pattern**(figure below)



We see elongated strands of epithelium, they aren't in the middle like the follicular pattern, they are thin strands anastomosing and branching. Another difference is that the cystic degeneration occurs in the connective tissue.



## Pathogenesis:

One theory suggests that the origin is from the **dental lamina** which gives the enamel organ. Another theory suggests that it's formed from **epithelial the lining of the odontogenic cyst** (one of the complications of odontogenic cysts is ameloblastoma).

**Peripheral ameloblastoma**(that occurs on the gingiva) could originate from **the basal layer of the oral epithelium**(as the basal layer cells are hyperchromatic columnar-cuboidal cells just like the ameloblastoma cells).treatment is conservative; just surgical removal of the lesion

The behavior as we said is locally destructive; the follicles will invade the marrow spaces making it difficult to completely remove the lesion.

Sometimes we end up with resection of a big part of the mandible. So it's a **locally destructive benign tumour**. Sometimes during



the surgery there might be aspiration of some cells to the lungs leading to ameloblastoma formation in the lung >> the clinician may think that this is a **malignant ameloblastoma** that metastasized to the lungs! >> Most of the time it's not malignant, it's just aspiration of cells during surgery.

**Unicystic ameloblastoma can't be diagnosed radiographically.** U need to send it to the pathology lab, and there they can tell whether it's unicystic or follicular based on the microscopic features.

In unicystic ameloblastoma we'll have a cyst but the epithelial lining is like ameloblastoma. >> it should be confined to the epithelial lining>> if it's in the epithelium and protruding into the lumen, it's unicystic >> if it's invading the connective tissue, it's no more unicystic, so it will need aggressive treatment just like the regular ameloblastoma.

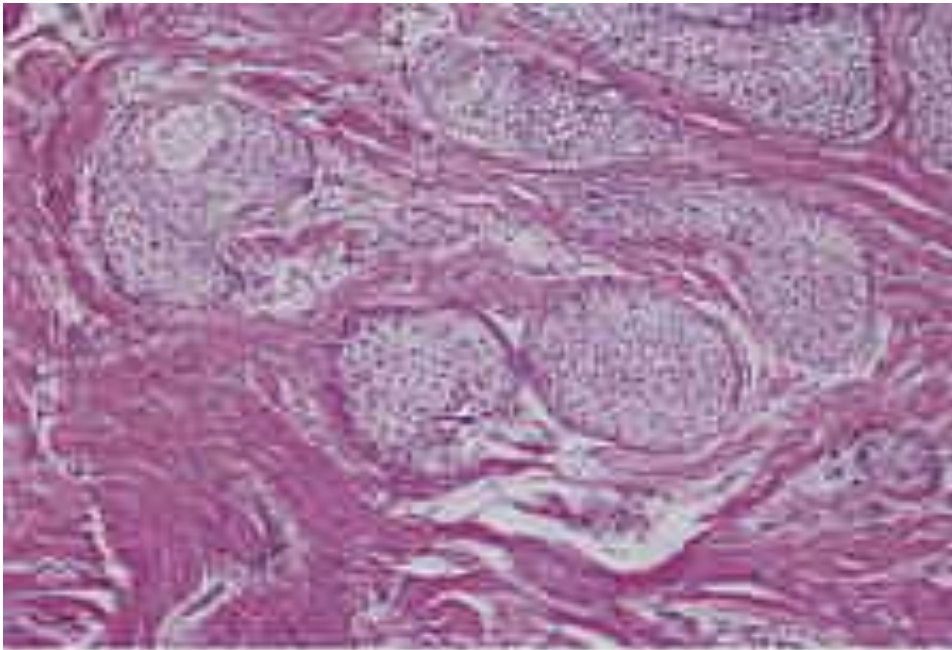
So the treatment of unicystic ameloblastoma is conservative bcz u treat it like a cyst as there is no invagination of the underlying connective tissue.

### Squamous odontogenic tumour:

Epithelial origin. The lesion will present clinically as a **well-defined radiolucent area between the teeth and causing displacement of the roots** >> the tooth may present with mobility despite good oral hygiene and absence of periodontal disease >> take ur radiograph and put ur list of **differential diagnoses: OKC, ameloblastoma, Squamous odontogenic tumour, and other odontogenic tumours**



## Histopathology:



**Look at the peripheral layer of the epithelial islands, its flattened and squamous >> immediately exclude ameloblastoma.**

**The surrounding tissue is just a regular connective tissue with scattered fibroblasts >> no increase in density of fibroblasts.**

**The epithelial origin of the tumour epithelium may be the epithelial rests of Malassez. >> These rests occur in the apical area and that's why this lesion occurs between the roots.**

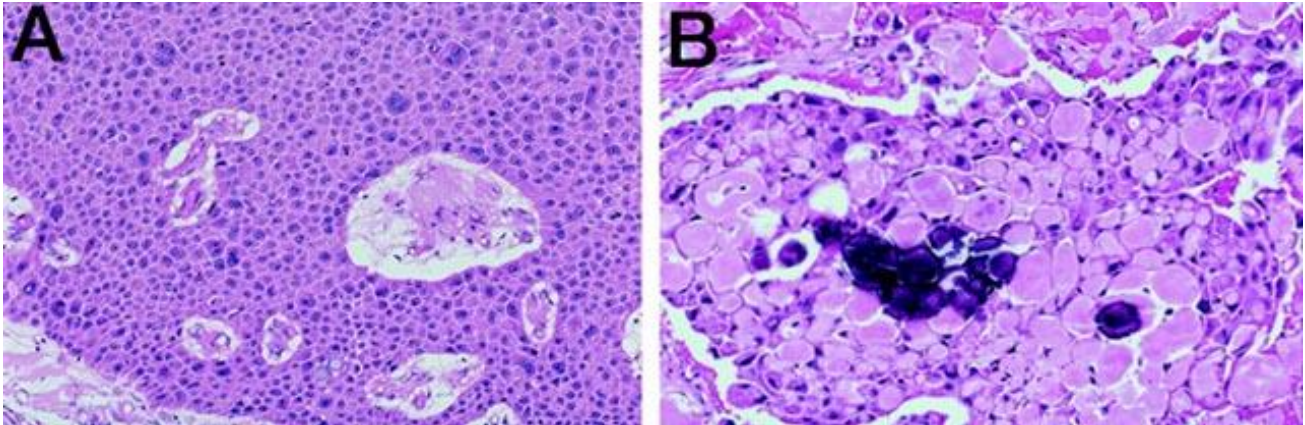
Treatment may be aggressive like some big lesions that may displace teeth, but it's usually conservative with curettage (using curettes that have spoon-like shape) of the lesion i.e., you inoculate the lesion and scratch the surrounding bone to make sure that no cells are in the marrow spaces, but you don't have to have a safe margin.



## Calcifying epithelial odontogenic tumour (CEOT)

It has another name which is **Bong-Bong** tumour (not sure about the spelling).

### Histopathology:



We like the histopathology of this lesion bcz it's characteristic. take a look, all these are **epithelial cells polyhedral in shape**. look at the intercellular spaces, can u see **the intercellular junctions, they are very obvious (B)**, at **higher magnification u can even see the desmosomes >>** when u see an epithelial mass with obvious intercellular junctions, start thinking of CEOT.

**The nuclei are pleomorphic (A)**; u can see large kidney shaped nuclei, or big clefted nuclei with eosinophilic cytoplasm, or rounded small nuclei>> **here this isn't a feature of malignancy.**

**We may also have amyloid-like protein** as homogenous eosinophilic material or it may be calcified.

**CEOT is benign but locally invasive, more common in the mandible (molar-premolar region), crowns of unerupted tooth just like OKC and ameloblastoma. It's less aggressive than ameloblastoma.**

**Radiographically**, we see varying amounts of radiopaque bodies, from calcification of the amyloid or a product of the epithelial cells.

## Adenomatoid odontogenic tumour:

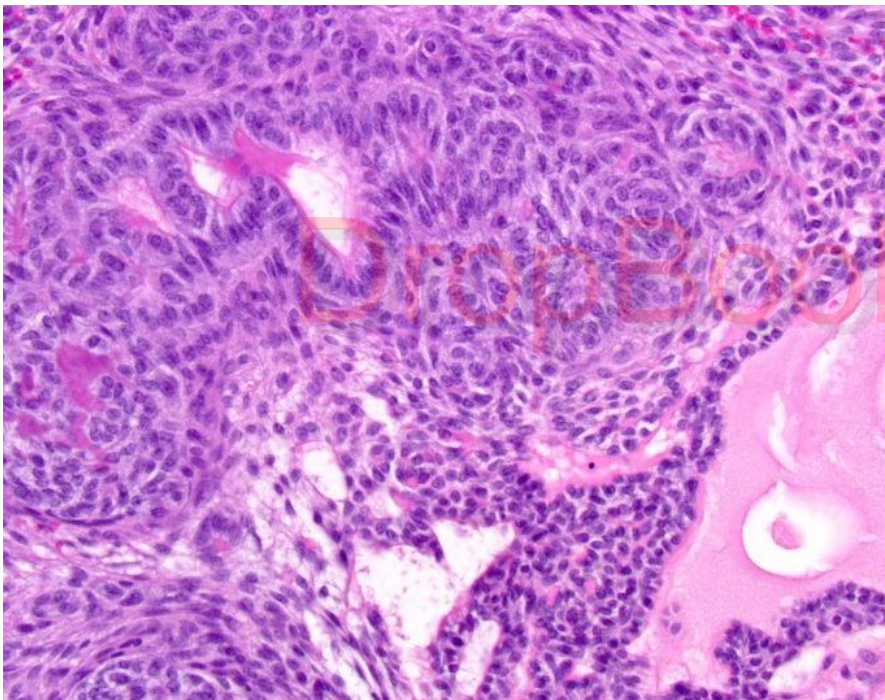
**Epithelial origin.** When we say adenoma, what do u understand?  
Epithelial, glandular and benign.

Had el tumour mne7, w ma by3ml m\$akl ;), occurring in the ant. Maxilla and associated with unerupted teeth especially canine area. The lesion is well-defined.

There is a rare extraosseous variant that can occur on the gingiva.

Treatment is inoculation.

### Histopathology:



This tissue is spindled and looks like fibroblasts, but it's not!! All what u see here is **epithelium in the form of spindled, storiform** (y3ni ma5d 3dt etjahat), in bundles and **gland like structures**, the lining of these glandular structure is from the same epithelium but in different form.

Calcifications may occur; u may also see dentine or enamel matrix.

Treatment is conservative.



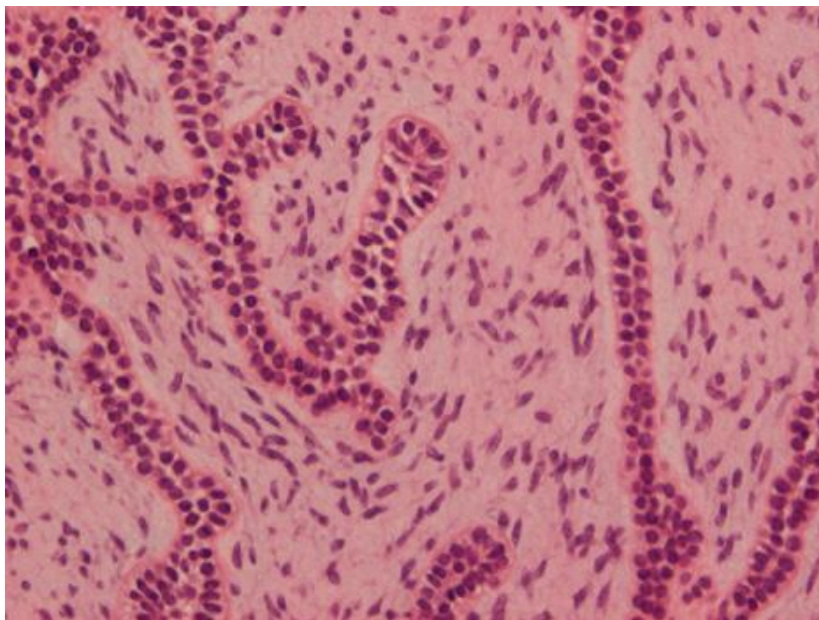
## Ameloblastic fibroma:

Mixed lesion. It's much better than ameloblastoma, bcz it's not destructive, and it doesn't need aggressive treatment. If the pt. has the choice to select between ameloblastoma and Ameloblastic fibroma, then Ameloblastic fibroma a7san 😊.

**Occur in post. Mandible, and in younger age groups. It has a degree of recurrence**

**Radiographically**, well defined lesion associated with unerupted tooth.

**Histopathologically**, u should differentiate between ameloblastoma & Ameloblastic fibroma. In the later, the stroma contains stellate fibroblasts, they are young fibroblasts and not spindled shaped, and there is increase in density of these stellate fibroblasts. (Giant cell fibromas also have stellate-like fibroblasts). The density of nuclei is high, so this is a fibroma lesion, not ameloblastoma. Less stellate reticulum than in ameloblastoma



If the lesion produces enamel, we call it **Ameloblastic fibro-odontoma**. If it produces dentin, it will be called **Ameloblastic fibrodentinoma**.



## Calcifying cystic odontogenic tumour:

In the past they thought it was a cyst (it was called calcifying odontogenic cyst COC), but now it's considered a tumour. It has another name Gorlin cyst. You will link this lesion to another one called **dentinogenic ghost cell tumour**, bcz both of them produce ghost cells. **Calcifying cystic odontogenic tumour has better prognosis, better behavior i.e., less aggressive, and occur in younger age groups than the dentinogenic ghost cell tumour.**

The Calcifying cystic odontogenic tumour is a cystic lesion but the dentinogenic ghost cell tumour is a solid lesion. In the past the dentinogenic ghost cell tumour was thought to be just a solid variant of the cystic lesion, but in fact, they are 2 separate lesions not variants.

**Radiographically**, the Calcifying cystic odontogenic tumour may show as a radiolucent lesion with calcified particle>> y3ni we see **variable mixed radiolucent-radiopaque lesion.**

**The Calcifying cystic odontogenic tumour occurs in pts. below age 40, but the dentinogenic ghost cell tumour occur in older age groups.**

**The Calcifying cystic odontogenic tumour prefers the ant. First molar region i.e., in the premolar area, but it can occur anywhere!! It can be associated with crowns of unerupted teeth, and be careful if the lesion is still in an early stage, it may just be a radiolucent lesion.**

**Treatment is conservative.**

**Histopathologically**, The Calcifying cystic odontogenic tumour has a lining and this lining looks like ameloblastoma. The columnar epithelium is polarized away from the surrounding connective tissue. It also has stellate like cells. **The difference is that it has a lot of keratinization and u see the shadow of ghost cells.** These cells are more prone to keratinization and calcification.

The COC can arise from the lining of any cyst, it may be associated with an odontome, or an unerupted tooth

**the dentinogenic ghost cell tumour occur in older age groups, only some cases will respond to conservative treatment , but the majority need aggressive treatment>> its more locally invasive, just like ameloblastoma.**

### **Odontogenic fibroma:**

**Origin is mesenchymal**, but why we said "**odontogenic**"? Because the fibroma is from the dental papilla which is odontogenic, and bcz we have odontogenic epithelium remnants, but it's not lesional or neoplastic.

Why we put myxoma here?? So that u can notice that these are the ends of spectrum. The fibroma has dense collagen and dense fibroblasts while the myxoma has very loose fibers and a lot of myxoid tissue with a lot of ground substance i.e., it's not dense at all >> kman \$wi b9er liquid like.

**The fibroblasts in the fibroma are more mature, while in myxoma they are very thin and spindled. >> The more the lesion originates from dental follicle, the more myxoid it becomes.**

**Treatment of fibroma is much easier, bcz the curettage of it is much easier than that of the myxoma (bcz myxoma is gelatinous)>> recurrence rate is much higher in myxoma.**

**The lesion may be related to the root, the crown, or even replacing a tooth. In fibroma, the lesion is well-defined and more fibroblastic.**

**Peripheral lesions may occur in the fibroma. Do you remember the differential diagnoses of epulis?? It's the 3 Ps**

1. **Pyogenic granuloma**
2. **Peripheral giant cell granuloma**
3. **Peripheral ossifying fibroma**
4. Now, add the 4<sup>th</sup> P: **Peripheral odontogenic fibroma** >> it's a fibroblastic lesion with occasional remnants of odontogenic epithelium, not neoplastic; just incidental finding. The lesional cells are fibroblastic, spindled, mature and dense unlike the Ameloblastic fibroma where the cells are young and stellate. U may find some cementum or dentin (bcz they are of mesenchymal origin).

The lesion in myxoma is more gelatinous, delicate; it has a lot of ground substance which is **glycosaminoglycans**.

**Radiographically, we see the honey-comb appearance or soap bubble appearance (remember: the differential diagnoses of honey-comb appearance, or soap bubble appearance: central hemangioma, aneurismal bone cyst & myxoma) >> the surgeon should make an aspiration to make sure that this isn't a blood-filled lesion.**

**Myxoma is more common than fibroma, but its more locally invasive >> bcz its gelatinous >> easy spread in the marrow spaces>> It will induce root resorption & bone expansion.**

We said earlier that myxoma and fibroma are the ends of spectrum; if we have a slightly fibrous lesion and the myxoma is dominant we call it **fibromyxoma**. If the fibroma is dominant we call it **myxofibroma**.



## Cementoblastoma:

**Mesenchymal origin.** The characteristic feature is that the lesion is fused to the roots. The tooth is generally vital, but it may be carious or necrotic.

**Radiographically,** the lesion is well-defined, surrounded by a radiolucent rim (bcz this is the actively growing margin of the lesion >> more cellular soft tissue with hyper chromatic cementoblasts that lay down cementum >> radiolucent) and fused to the roots. Bone density-like material, less radiopaque than enamel. It looks like osteoblastoma except that the osteoblastoma isn't fused to the roots.

**Occur in pts. < 25 years. Mandibular premolar-molar region. This lesion is painful, and since it's a tumour it may recur if it's not completely removed.**

## Part II : malignant Odontogenic tumours

### malignant ameloblastoma & ameloblastic carcinoma.

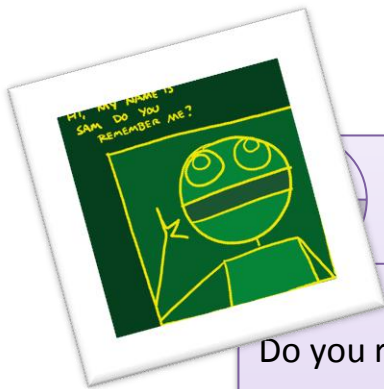
For ameloblastoma We have 2 types of malignant changes: **malignant ameloblastoma** and **ameloblastic carcinoma**.

When I say **ameloblastic carcinoma** this means I have seen pleomorphism, hyperchromatism and mitotic figures in the ameloblastoma. On the other hand, **malignant ameloblastoma** is the ameloblastoma that do metastasize, for example: they found in a lymph node a mass >> biopsy >> microscopic examination >> they found ameloblastoma which **looks benign** >> we just called it "malignant" because it metastasized, **this condition is rare**.

**Malignant ameloblastoma** may induce metastasis to the lungs (but this is rare) >> this happens due to aspiration of neoplastic cells at the time of surgery!! >> the dr had a case for a patient who was diagnosed as ameloblastoma in the maxilla >> recurrence of the ameloblastoma in the temporal area >> then recurrence in the SCALP >> these recurrences didn't have malignant changes so we first think of **malignant ameloblastoma** that happened due to seeding of the cells during surgery, but in the last recurrence there was a lot of malignant changes and the case was diagnosed as **ameloblastic carcinoma** ☹️

## In bone:

a pt may come to u with this radiolucent lesion which is ill defined, we'll think of osteosarcoma, chondrosarcoma, or any malignant intraosseous lesion, we can also think of Odontogenic tumours, but we'll also think of **primary intraosseous carcinoma** >> y3ni due to Odontogenic epithelial remnants (like remnants of Hertswegg root sheath, reduced enamel epithelium, or Odontogenic cyst ) >> so,, **from Odontogenic epithelium we may have carcinoma intraosseous** >> some of the intraosseous carcinomas will be **Odontogenic** i.e., those from Odontogenic epithelial origin , others aren't Odontogenic in origin.



Do you remember when we took the dentigerous cyst, we said that from the complications of Odontogenic cysts that there might be malignant transformation into SCC, ameloblastoma, or to mucoepidermoid carcinoma.

**The option of having malignant changes in Odontogenic cysts: radicular, residual, dentigerous and keratocyst (the last two are the most common)**

There is still a probability that the tumour was there and cystic degeneration occurred within the tumour>> we may find a cyst within the tumour or a tumour within the cyst!!



## ameloblastic fibrosarcoma

Do you remember what we said about Ameloblastic fibroma? Its epithelial and mesenchymal in origin. It has epithelial component and a fibrous component, both are neoplastic. Sometimes the fibrous component will show malignant changes (pleomorphism, hyperchromatism and mitotic figures, increased nuclear to cytoplasmic ratio,, etc.) >> in this case it's called **ameloblastic fibrosarcoma** i.e., the malignant counter part of ameloblastic fibroma >> and if the Ameloblastic fibrosarcoma was forming dentin or hard tissue, we'll call it **Ameloblastic fibrodentinosa**.

## lesions of debatable origin

We have 2 lesions of debatable origin:

### 1. **Melanotic neuroectodermal tumour of infancy:**

Includes expansion of the maxilla intra bony lesion: radiolucent lesion, sometimes with ill-defined margins, sometimes the teeth appear floating within the radiolucency. **It occurs in infants**, usually the deciduous teeth aren't erupted yet >> u take a radiograph >> the teeth appear floating within the radiolucency >> **its more common the maxilla. It's called melanotic neuroectodermal tumour of infancy** (bcz there is evidence of neural crest origin "**neuroectodermal**", and bcz there is melanin pigments formation within the tumour "**melanotic**"). **It's benign, and recurrence is rare.**

## 2. congenital epulis, or congenital gingival granular cell tumour :

Soft tissue lesion i.e., mass on the gingiva i.e., epulis : this **congenital epulis, or congenital gingival granular cell tumour** is different from the regular epulis u know : the cells in this lesion are small cuboidal with granular cytoplasm , those cells are S-100 negative, and **this** how we differentiate this lesion from the granular cell tumour were the cells are S-100 positive. more common in females ☹, more common in anterior maxilla

مُتِ نَحْمَدُ اللهَ-

*M. Faradat*

